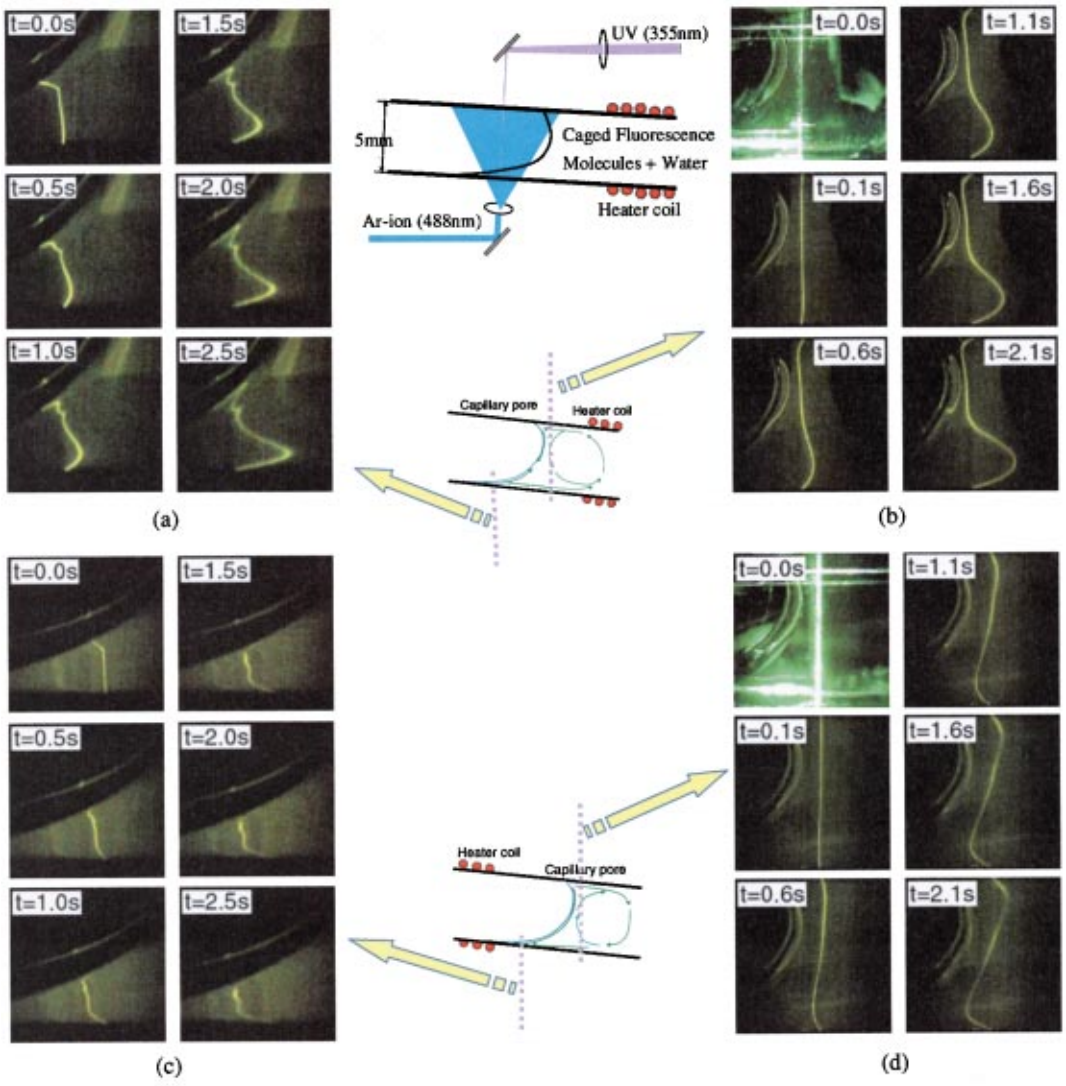

LAGRANGIAN FLOW MAPPING OF HEATED CAPILLARY PORE AND THIN FILM USING MOLECULAR FLUORESCENCE VELOCIMETRY (MFV)

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Molecular Fluorescence Velocimetry (MFV) technique has been developed and applied to map the Lagrangian velocity fields for a heated capillary pore and its thin film region. MFV uses caged fluorescence dye molecules (Dextran Photo-Activated Fluorophores of less than 10 nm size) that are uncaged and tagged with the exposure to UV line of 355 nm in wavelength and 15-μm beam diameter. The tagged molecules are pumped by the blue laser (λ=488 nm) for fluorescence and sequentially recorded fluorescence images reveal detailed flow history for an extremely small scale flow field such as a microscale thin film region. For the nearly horizontal pore of 5-mm diameter with five degrees of inclination, (a) and (b) show the flow development for the thin film region and the bulk pore region, respectively, when the heater is located in the liquid side. For the heater located in the vapor side, (c) and (d) show the flow development. The thermally driven flow near the bottom surface is directed to the heater location for both cases and the present study evidences a fully three-dimensional flow exists below the meniscus and inside the thin film region. Note that the distorted, but similar images just below the interface shown in (a) and (c) are formed by the mirror-like reflection of the real fluorescence image from the concave meniscus surface.

